

Operating Manual SPI1021

updated: 2022-08-03 /Sc
from Firmware: 0-0



For more information and help about this product please scan the **QR-Code** or choose the following link: [SPI1021](#)

Operating manual, Quick guide, Datasheet, Connection diagram, CAD Data
Firmwareupdates, FAQ, Videos about installation and settings, Certificates

- Grid- and Plant Protection According to CEI 0-21 and DEWA standard
- with self-test for < 11kW and Watchdog
- with integrated vector shift relay
- Pr3 = default



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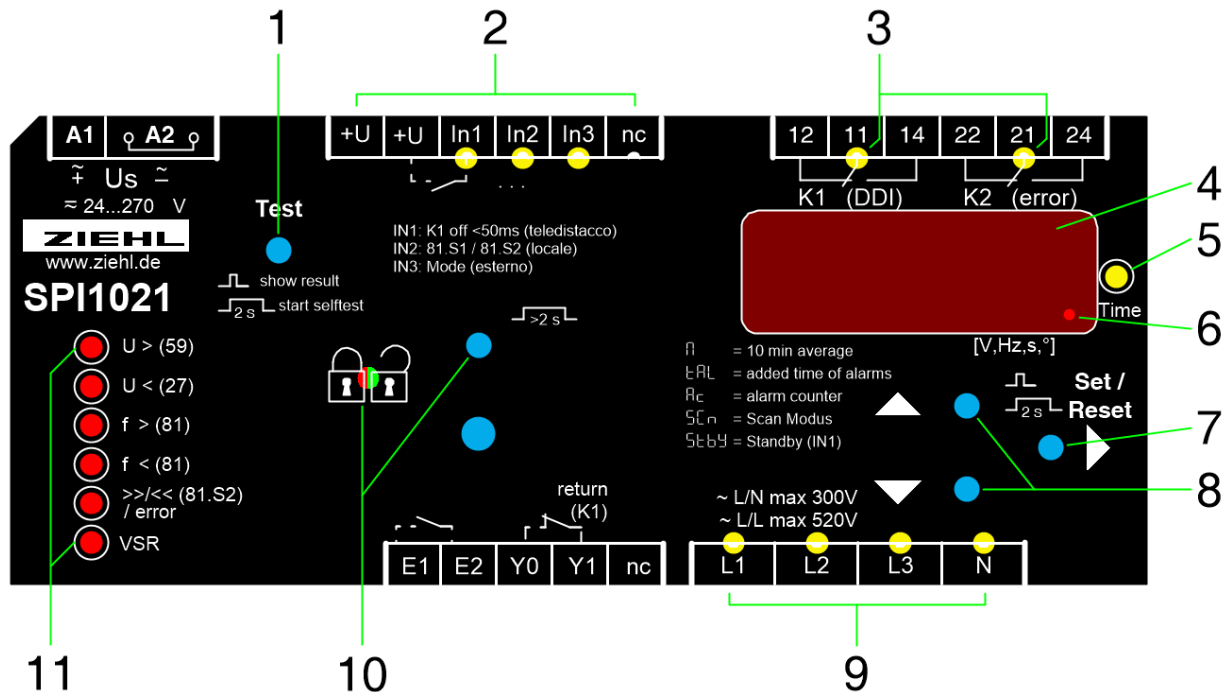
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1 General Notes

Compliance with the following instructions is mandatory to ensure the functionality and safety of the product. If the following instructions given especially but not limited for general safety, transport, storage, mounting, operating conditions, commissioning and disposal / recycling are not observed, the product may not operate safely and may cause a hazard to the life and limb of users and third parties.

Deviations from the following requirements may therefore lead both to the loss of the statutory material defect liability rights and to the liability of the buyer for the product that has become unsafe due to the deviation from the specifications.

2 Display and controls



1 Test Button

Press briefly
Press for > 2 s

The self-test result is displayed, display next result
Start self-test, K1 de-energize, K2 energize (K2 = off in Pr4, 5 and 6)

2 LEDs Inputs status (yellow)

OFF Input not active (open)
ON Input active (closed)

3 LEDs relay status (yellow)

OFF Relay is released
ON Relay is operating

4 Digital display 4-digits (red)

Depending on program, display of current voltage, frequency, vector shift, average value
Displays the alarm signals, e.g. **AL**, **AL** **n**
Displays the errors with error code e.g. **Err9**

5 LED Time (yellow)

ON A time is displayed

6 Last decimal point (red)

OFF Display mode
Illuminated Menu mode
Flashes Configuration mode

- 7 **Set / Reset key** ► (in display mode, normal state)
- | | |
|------------------|--|
| Press briefly | Display of next measured value / alarm counter |
| Press for > 2 s | Reset, quit error messages |
| Press for > 4 s | Displays the program, e.g. Pr I |
| Press for > 10 s | Displays the software version, e.g. 0-0 |
- 8 **Up / Down key** ▲ ▼ (in display mode, normal state)
- | | |
|-----------------|--|
| Press briefly | Change to the menu mode, display of alarm memory (Down) / cumulative time of alarms, standby counter, standby time (Up), pushing Set button for ≥ 2 s resets the stored values |
| Press for > 2 s | Display of MAX (Up) / MIN (Down) - measured values, additional pushing of Set button for ≥ 2 s deletes the stored values |
- 9 **LEDs measurement allocation** (yellow)
- | | |
|---------------------|---|
| LEDs | Measured value |
| Lx and N ON | Voltage value (L1 against N, L2 against N, L3 against N) |
| Lx and Ly ON | Voltage value (L1 against L2, L2 against L3, L1 against L3) |
| Lx FLASHING quickly | Vector surge (L1, L2, L3) |
| L1 FLASHING | Frequency |
- 10 **sealable button + LED**  
- | | |
|---|--|
| Press for > 2 s | Lock / Unlock |
| LED red  | Settings and simulation mode are locked, While attempting to set, Loc is displayed for 3s |
| LED green | Setting and simulation enabled |
- 11 **LEDs frequency / voltage / VSR Limit value undercut / exceeded** (red)
- | | |
|-----------------------------------|--------------------------------------|
| ON, RL or RL Π | Limit value undercut / exceeded |
| FLASHES, RL or RL Π | Reset delay doF counting down |

3 Default settings and firmware version

When changing programs, all parameters are reset to the *default settings.

Menu item	Parameter / Unit			Default setting						User data
				CEI 0-21			DEWA			
				3AC+N 230V	3AC 400V	1AC+N 230V	3AC+N 230V	3AC 400V	3AC 100V	
				P _{r1}	P _{r2}	P _{r3} *	P _{r4}	P _{r5}	P _{r6}	
U ⁻⁻⁻ 59.S2 59>S2	U ⁻⁻⁻	Alarm on/off		oFF	oFF	oFF	oFF	oFF	oFF	
	U ⁻⁻⁻	Overvoltage	V	264	458	264	264	458	115	
	H ⁻⁻⁻	Hysteresis	V	10.5	17.5	10.5	10.5	17.5	4.5	
	dRL	Response time	s	0.10	0.10	0.10	0.10	0.10	0.10	
	doF	OFF-delay	s	0	0	0	0	0	0	
U ⁻ 59.S1 59>S1	U ⁻	Alarm on/off		on	on	on	on	on	on	
	U ⁻	Overvoltage	V	264	458	264	253	438	120	
	H ⁻	Hysteresis	V	10.5	17.5	10.5	10.5	17.5	4.3	
	dRL	Response time	s	0.20	0.20	0.20	0.20	0.20	0.60	
	doF	OFF-delay	s	0	0	0	0	0	0	
UN 59-Av	UN	Alarm on/off		on	on	on	on	on	on	
	UN	Overvoltage	V	253	438	253	253	438	110	
	HN	Hysteresis	V	10.0	17.5	10.0	10.0	17.5	4.3	
	dRL	Response time	s	3.00	3.00	3.00	3.00	3.00	3.00	
	doF	OFF-delay	s	0	0	0	0	0	0	
U ₋ 27.S1 27<S1	U ₋	Alarm on/off		on	on	on	on	on	on	
	U ₋	Undervoltage	V	196	339	196	196	339	85.0	
	H ₋	Hysteresis	V	8.0	13.5	8.0	8.0	13.5	3.5	
	dRL	Response time	s	1.50	1.50	1.50	0.40	0.40	1.50	
	doF	OFF-delay	s	0	0	0	0	0	0	
U ₋₋ 27.S2 27<S2	U ₋₋	Alarm on/off		on	on	on	on	on	on	
	U ₋₋	Undervoltage	V	34.5	60.0	34.5	92.0	159	3.0	
	H ₋₋	Hysteresis	V	3.7	3.7	3.7	3.7	6.4	1.5	
	dRL	Response time	s	0.20	0.20	0.20	0.20	0.20	0.20	
	doF	OFF-delay	s	0	0	0	0	0	0	
F ⁻⁻⁻ 81.S2 81>S2	F ⁻⁻⁻	Alarm on/off		on	on	on	on	on	on	
	F ⁻⁻⁻	Overfrequency	Hz	51.50	51.50	51.50	54.00	54.00	54.00	
	H ⁻⁻⁻	Hysteresis	Hz	0.10	0.10	0.10	0.10	0.10	0.10	
	dRL	Response time	s	0.10	0.10	0.10	10.0	10.0	10.0	
	doF	OFF-delay	s	0	0	0	0	0	0	
F ⁻ 81.S1 81>S1	F ⁻	Alarm on/off		oFF	oFF	oFF	oFF	oFF	oFF	
	F ⁻	Overfrequency	Hz	50.20	50.20	50.20	52.50	52.50	52.50	
	H ⁻	Hysteresis	Hz	0.10	0.10	0.10	0.10	0.10	0.10	
	dRL	Response time	s	0.10	0.10	0.10	0.10	0.10	0.10	
	doF	OFF-delay	s	0	0	0	0	0	0	

Menu item	Parameter / Unit			CEI 0-21			DEWA			User data
				3AC+N 230V	3AC 400V	1AC+N 230V	3AC+N 230V	3AC 400V	3AC 100V	
				P _{r1}	P _{r2}	P _{r3} *	P _{r4}	P _{r5}	P _{r6}	
F ₋ 81.S1 81<S1	F ₋	Alarm on/off		oFF	oFF	oFF	oFF	oFF	oFF	
	F ₋	Underfrequency	Hz	49.80	49.80	49.80	47.50	47.50	47.50	
	H ₋	Hysteresis	Hz	0.10	0.10	0.10	0.10	0.10	0.10	
	dRL	Response time	s	0.10	0.10	0.10	4.00	4.00	4.00	
	doF	OFF-delay	s	0	0	0	0	0	0	
F ₋₋ 81.S2 81<S2	F ₋₋	Alarm on/off		on	on	on	on	on	on	
	F ₋₋	Underfrequency	Hz	47.50	47.50	47.50	46.00	46.00	46.00	
	H ₋₋	Hysteresis	Hz	0.10	0.10	0.10	0.10	0.10	0.10	
	dRL	Response time	s	0.10	0.10	0.10	10.0	10.0	10.0	
	doF	OFF-delay	s	0	0	0	0	0	0	
UonF	UonF	Alarm on/off		oFF	oFF	oFF	on	on	on	
	UonF	Voltage 0,2 Un	V	46.0	80.0	46.0	46.0	80.0	20.0	
u5r 78	u5r	Alarm on/off		oFF	oFF	oFF	oFF	oFF	oFF	
	u5r	Vector shift	°	10.0	10.0	10.0	10.0	10.0	10.0	
	doF	OFF-delay	s	3	3	3	1	1	1	
	dEon	Suppression time	s	2	2	2	2	2	2	
	u5r	Number of phases		3Ph	3Ph		3Ph	3Ph	3Ph	
rocF 81r	rocF	Alarm on/off		oFF	oFF	oFF	oFF	oFF	oFF	
	dFdt	delta f / delta t	Hz/s	0.800	0.800	0.800	2.000	2.000	2.000	
	PEr	periods		20	20	20	20	20	20	
	dRL	Response time	s	0.10	0.10	0.10	0.10	0.10	0.10	
	doF	OFF-delay	s	60	60	60	1	1	1	
rEL	ErEL	response time Y1	s	5.0	5.0	oFF	5.0	5.0	5.0	
	don	Delay On	s	300	300	300	300	300	300	
ModE	ModE	Mode		ErAn	ErAn	ErAn	ErAn	ErAn	ErAn	
	dRL	Response time(<</>>)	s	1.00	1.00	1.00	1.00	1.00	1.00	
	dRL	Response time(<</>>)	s	4.00	4.00	4.00	4.00	4.00	4.00	
ddi	ddi	Display delay	s	0.5	0.5	0.5	0.5	0.5	0.5	
	di t	Display duration 5Cn	s	3.5	3.5	3.5	3.5	3.5	3.5	
Si	U	Voltage	V	230	400	230	230	400	100	
	F	Frequency	Hz	50.00	50.00	50.00	50.00	50.00	50.00	
	u5r	Vector shift	°	0.0	0.0	0.0	0.0	0.0	0.0	
CodE	Pi n	Pincode		504	504	504	504	504	504	
	CodE	on/off		oFF	oFF	oFF	oFF	oFF	oFF	
I nFo	Fnr	Firmware version		0-0	0-0	0-0	0-0	0-0	0-0	
	5nr	Serial number		xxxxx	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx	
	h	Operating hours	h	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx	
	Err	Error counter		xxx	xxx	xxx	xxx	xxx	xxx	
	Pr	Program		1	2	3	4	5	6	

Display program: I nFo → Pr or when switching on, Display firmware version: I nFo → Fnr

4 Application and brief description

The SPI1021 monitors voltage and frequency in plants for own generation of electricity. It fulfills the requirements of CEI 0-21 + DEWA.

6 selectable programs allow measuring, 3 phases to neutral (4-wire mode), 3 phases phase-phase (3-wire mode) and single phase to neutral (2-wire).

The SPI1021 can monitor all decentralized power plants, photovoltaic, wind or thermal, that feed in the low or medium voltage grid. In applications with possible asymmetry >6kVA, power balance has to be monitored extra.

All limits are preset according to CEI 0-21(Pr1-3) or DEWA (Pr4-6). They can be changed if required and be protected with a code and/or a seal.

A counter for alarms and standbys stores the last 100 events with reason and elapsed time. In addition, the time the SPI1021 has interrupted the plant is recorded. All values can be read displayed at the device and give the operator valuable information about the availability of the plant.

The standby input allows a remote shutoff e.g. with a RCR. It can also be used to switch to an energy saving mode by a timer or a twilight switch. Number of standbys and added time are stored and can be read in the display.

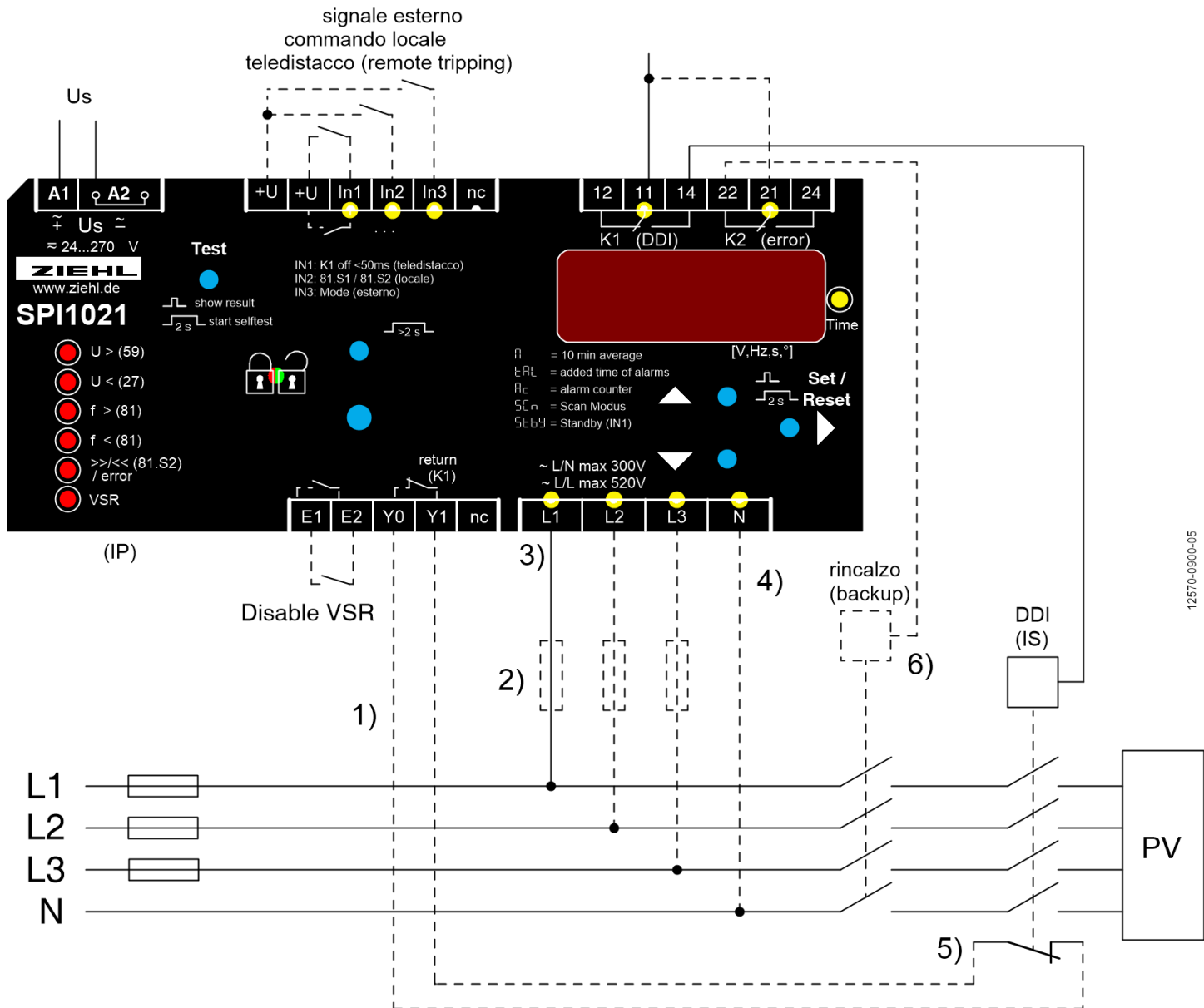
5 Summary of the functions

When the device has been installed, a self-test starts automatically. The self-test can be repeated when required. All values of the test are stored and can be read out at the display.

- Monitoring of under- and overvoltage 0/15-520 V
- Measuring of 3 phases with or without neutral or single phase
- Monitoring of over- and underfrequency 45-65 Hz (voltage dependent, adjustable)
- Monitoring of quality of voltage (10-minutes-average)
- Monitoring of vector-shift (connectible) and rocof (rate of change of frequency)
- Input IN2 for selection of frequency window
- Input IN3 for selection of mode transitory or definitive
- Input Y0/Y1 for monitoring function of connected switch (automatic detection of nc/no)
- Relay K2 picks up (on time <500ms) only at failure at switch connected to K1, only with manual reset
- 2 restarts at switch-on error of connected switch
- Self-test with storing of values
- Switching delays adjustable 0,05...130 s
- Switching-back-delays adjustable 0...999 s
- Different switching time according to type of alarm and selected mode
- Switch-on delay 300 s
- All parameters preset according to CEI 0-21
- Alarm counter for 100 alarms with value, reason and elapsed time
- Recording of added time of alarms
- Input for standby (off time <50ms) with counter and recording of time
- Simulation for testing
- Sealing, all parameters can be read out while sealed
- Easy installation and programming with 6 preset programs
- Supply-voltage AC/DC 24-270 V
- Housing for DIN-rail-mount, 105 mm wide, mounting height 70 mm

6 Connection diagram

1x PV, 2x section switch



- 1) Feedback contacts not connected set $rEL \rightarrow ErEL \rightarrow OFF$
- 2) Fuses only when line protection necessary, e.g. 3x16A
- 3) $Pr 3$ Phase connect to $L1$, $L2$ and $L3$ are not connected
- 4) N connected set $Pr 1$, $Pr 3$, $Pr 4$
- 5) NC- or NO-contacts can be connected, automatic detection when switching on
- 6) must be connected for plants $\geq 20kW$

7 Important information



A marked switch and a protective device must be provided in the supply line in the vicinity of the device (easily accessible) as a disconnecting element (rated current $\leq 6\text{A}$).

Flawless and safe operation of such a device requires proper transport and storage, professional installation and later commissioning along with operation as intended.

Only persons who are familiar with the installation, commissioning and operation of the device and who are correspondingly qualified for their job are permitted to work on the device. They must comply with the contents of the operating manual, the instructions attached to the device and the pertinent safety regulations for the erection and operation of electrical equipment.

The devices are built and certified in accordance with EN 60255 and leave the factory in a safe and technically flawless condition. To maintain this condition they must comply with the safety regulations marked in the operating manual with the headline "Caution". Failure to follow the safety regulations can lead to death, bodily injury or property damage to the device itself and to other devices and equipment.

If the information contained in the operating instructions/operating manual are not sufficient, please contact us directly or contact your responsible agency or representative.

Instead of the industrial norms and stipulations stated in the operating manual and applicable in Europe you must comply with the valid and applicable regulations in the country of utilisation if the device is used outside of the area of application.



WARNING

Hazards electrical voltage!

Can lead to an electric shock and burns.

Disconnect and de-energize before working on the system and the device.

Comply with the maximum permissible temperature when installing in a switch cabinet. Ensure sufficient clearance to other devices or heat sources. If cooling is inhibited, e.g., through close proximity to devices with increased surface temperature or interference with the cooling-air current, the permissible ambient temperature is decreased.



Caution!

Before you apply mains voltage to the device, make sure that the permissible control voltage **Us** on the side rating plate matches the mains voltage connected to the device!

8 Assembly

The device can be mounted:

- Distribution panel or control panel on 35 mm rail according to EN 60715

9 Detailed description

9.1 Description of the connections

Connection	Description
A1 and A2	Rated control supply voltage U_s , see Technical Data
11, 12, 14; 21, 22, 24	Relay K1 (DDI) und K2 (rincalzo, back up, only with manual reset)
E1 – E2 Enable – Input	volt-free contact
	$u5r \rightarrow oFF$, no function
	$u5r \rightarrow on$, E1-E2 closed: Vector shift active but not evaluated, monitoring of feedback contacts off for use with generator (mains synchronization)
Y0, Y1 Inputs feedback contacts	Volt-free n/o or n/c contact, self-learning when switching on
	Set value > turn-on time section switch under $rEL \rightarrow t_rEL$ / can switch-off if not connected or if external devices/switches can activate the section switch (oFF)
+U	Supply output for digital outputs, DC 15...35 V
IN1 (teledistacco, RCR)	volt-free contact
	closed: K1 released <50 ms (Standby mode, $StBY$)
IN2 (commando locale)	volt-free contact
	<u>transitory mode</u>
	open: $F^{--} + F_{--} = on$; $F^{-} + F_{-} = oFF$
	closed: $F^{--} + F_{--} = oFF$; $F^{-} + F_{-} = on$
	<u>definitiv mode</u>
	open: $F^{--} + F_{--} = oFF$; $F^{-} + F_{-} = on$
	closed: $F^{--} + F_{--} = on$; $F^{-} + F_{-} = oFF$;
	alternative response time: $dAL^{-} + dAL_{-}$ active
IN3 (segnale esterno)	volt-free contact
	$noDE \rightarrow t_rRn$, $noDE \rightarrow dEF_1$, no function
	$noDE \rightarrow In3$, closed: Definitiv mode open: Transitory mode
L1, L2, L3, N	Phase L1, L2, L3 and neutral conductor

9.2 functional characteristics

Functional characteristics	Explanation
VSR display value	The highest measured value is always displayed. The display value is reset to 0 by deleting the max. Value and when resetting into the go (good) state.
Delay Enable On time	Runs down when starting the unit and after opening the enable input; during this time there is no evaluation of the vector shift
Reset time	When a reset time dof is running, it is always counted down in the display (shortest one first)
Reset	Use the Reset key or interrupt the control voltage for > 2 s (comply with reset delay)
Display mode Scn	After the last measurement it switches into the scan mode; this is indicated by the display Scn . All measurements will now be displayed cyclically for the time set in d1t .
MIN / MAX values	All min and max values are saved zero-voltage maintained (non-volatile).
Alarm counter	The unit saves max 100 alarms (cause, measurement value, at operating time). The LEDs indicate the cause; the tripping value that led to the alarm each stands in the 7-segment display. Alternately the time difference, current operating time – tripping operating time is displayed. (how long ago the alarm triggered)
Cumulative alarm time tAL	The cumulative alarm time TAL indicates how long the relay was switched off due to an alarm. It is recorded with a resolution of 1 minute and only when the control voltage is applied. Query: In the display mode ► button to Rc is displayed. 1x ▲ button = Cumulative alarm time tAL
Standby mode	If IN1 is closed (e.g., by ripple control receiver, timer, dimmer), Relays K1 switched off. The number and duration of the shutdowns is recorded. Query: In the display mode ► button to Rc is displayed. 2x ▲ button = Standby counter StbY 1x ▲ button = Standby time StbY
Automatic restart attempts	If there is an error by the feedback contacts Err1 , 2 restart attempts are automatically performed in an interval of 10s. False triggering by undervoltage trips (e.g. during a thunderstorm) do not lead to permanent shut-down.
Frequency undervoltage protection UonF	if one of the measured voltages less than UonF , the frequency evaluation is interrupted until all voltages have exceeded UonF . (does not apply to device start / apply of the control voltage)

10 Commissioning

10.1 Program Setup

The suitable program must be set on the SPI1021 in accordance with the application. If the SPI1021 is sealed/locked (red LED illuminated), the sealing has to be deactivated first.

Pr	Connection	Limit	Rated voltage	default setting	Standard
1	3 AC with N	2x overvoltage, 2x undervoltage 2x overfrequency, 2x underfrequency 10min mean value, 1x vector shift, 1x rocof	230V	CEI 0-21	CEI 0-21 + DEWA
2	3 AC without N		400V	CEI 0-21	
*3	1 AC with N		230V	CEI 0-21	
4	3 AC with N		230V	DEWA	
5	3 AC without N		400V	DEWA	
6	3 AC without N		100V	DEWA	

* default setting

Adjustment process:

If present, remove seal (only authorized person)

- Apply control supply voltage at A1-A2
- Slightly lift the key cover and turn 180°
- Actuate the small blue button by firmly pressing the button cover (LED starts flashing) until the green LED  is illuminated.

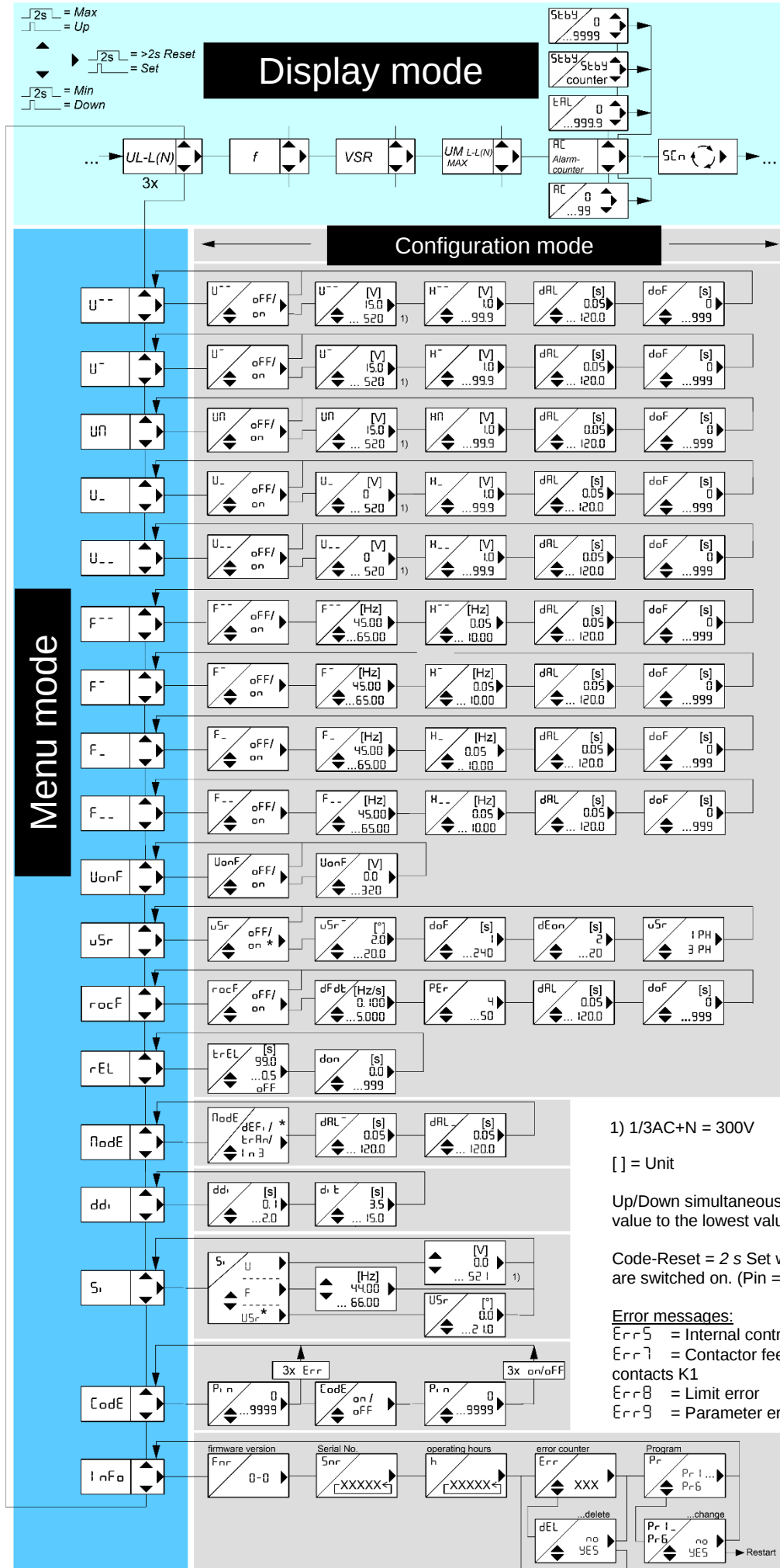
Sealing is deactivated

- Press  button 1x → display **I n F a.**
 - Press  button 5x → display **P r l.**
 - Set the program with the buttons  
 - Press  button 1x → display **n a.**
 - Press  button 1x → display **9 E 5.**
 - Press  button
- ⇒ Device resets and starts with the newly selected program

Hint:

When changing programs, all parameters of the selected program are reset to “default settings (see table „Default settings“). **Only change the parameters after having selected the correct program.**

10.2 Control chart Pr 1...6



10.3 description of the parameters

Parameters	Display	Explanation	Adjustment range
Power up delay (delay On)	dOn	Runs once at startup device, adjustable rEL → dOn	0.0 ... 999
Limit value	U⁻⁻⁻ U₋ U_n	Voltage limit value	15.0 ... 300 15.0 ... 520
Limit value	F⁻⁻⁻ , F⁻ , F₋ , F₋₋	Frequency limit value	45.00 ... 65.00
Frequency Undervoltage	UonF	frequency undervoltage, below this value the frequency protection is inhibited	0.0 ... 320
Hysteresis	H	253V (Limit) – 3V (Hysteresis) = 250V (Reset value) If the limit value is offset in Pr1 or Pr2 at F⁻ , the hysteresis also has to be adapted.	1.0 ... 99.0 0.05 ... 10.00
Response time (delay Alarm)	dAL	An alarm is suppressed for the set time (seconds)	0.05 ... 120.0
Turn-on time (delay Off)	doF	Reset is delayed for the set time, also during voltage recovery, this time (seconds) is always counted down in the display	0 ... 999
Enable time (delay On)	dEon	There is no evaluation of the vector shift during this time; starts with the application of the control voltage and when opening the Enable input	2 ... 20
VSR	uSr	1 Ph : a vector surge on one phase leads to an alarm 3 Ph : a vector surge on all phases simultaneously leads to an alarm	1 Ph ... 3 Ph
Limit value	dFdt	ROCOF, df/dt limit value	0.10 ... 5.00
Periods	PEr	Measuring time ROCOF, (4=sensitive, 50=insensitive) Response time= PEr * Period duration + dAL	4 ... 50
delay Display	ddi	Interval during which the display is updated in the display mode	0.1 ... 2.0

10.4 Display mode (last decimal point off)

In the display mode, the SPI1021 is in its normal state; here, depending on the program, the actual voltage, the highest actual 10 minute mean value, the frequency or the vector surge is displayed. In addition, the alarm signals (e.g. **AL**, **AL n**) and error codes (e.g. **Err9**) are displayed.

Function button Set / Reset	<u>Press briefly:</u>	Switches the measurement, alarm counter
	<u>Press for > 2 s:</u>	Resets after locked alarm (not possible if doF Reset delay is counting down)
	<u>Press for > 4 s:</u>	Displays the program, e.g. Pr 1
	<u>Press for > 10 s:</u>	Displays the software version, e.g. 0-03
Function key Up / Down	<u>Press briefly:</u>	Change into the menu mode, Display alarm counter: Down = Query the memory Up = Query the cumulative alarm time
	<u>Press for ≥ 2 s:</u>	Displays MAX and MIN measurements, additionally pressing the Set key for ≥ 2 s deletes the saved values

10.5 Menu mode (last decimal point on)

The menu mode is used to select the menu items. If no key is pressed for 30 s, one automatically returns to the display mode.

Function button Set / Reset	<u>Press briefly:</u> Change into the configuration mode
	<u>Press for ≥ 2 s:</u> Returns to the display mode (the most recently set values are then applied)
Function key Up / Down	<u>Press briefly:</u> Select menu item; changes into the display mode

10.6 Configuration mode (last Decimal point flashes)

In the configuration mode you can set the value of a parameter. The display alternates between the parameter relation and the currently set value until one of the Up/Down buttons is pressed, which changes the value of the parameter. If no key is pressed for 2 s the display starts alternating again.

If no key is pressed for 30 s (simulation mode 15 min) one automatically returns to the display mode (the most recently set value is applied during this)

Function button Set / Reset	<u>Press briefly:</u> The settings are taken over; continue to next parameter. Changes into menu mode after the last parameter
	<u>Press for ≥ 2 s:</u> Returns to the display mode (the most recently set values are then applied)
Function key Up / Down	<u>Press briefly/long:</u> Value change of the parameter (slow/fast)

Hint: Simultaneously pressing the Up and Down keys resets the adjustable value to zero. If the Up or Down button is kept pressed while setting the value the change in the display is accelerated.

10.7 Self-test execute

In programs 1, 3, 4 the SPI1021 has an automatic self-test as recommended in CEI 0-21 and DEWA.

K1 can pick up only after the self-test has been passed once.

Self-test starts automatically as soon as measuring voltage is connected for the first time to a new device and when there is no alarm! Self-test also starts automatically when program has been changed to 1, 3, 4.

Self-test can be started manually by pressing button Test for ≥ 2 s.

During the Self-test is **EE5E** displayed.

At the end of the test the result **PR55** (passed) or **FRi L** (not passed) is displayed for 30 seconds. Reset stops the test.

During self-test supply- and measuring-voltage may not be disconnected!

10.8 Display Self-test result

The values and times have been measured during self-test can be displayed by pressing button Test shortly.

Kind of limit (**U⁻⁻⁻**, **U⁻**, **UN**, **U₋**, **U₊**, **F⁻⁻⁻**, **F⁻**, **F₋**, **F₊**), response time, measured value, trigger value and adjusted limit are displayed. LEDs (yellow) at the terminals L1...N shows the measured and trigger value.

By pressing Test shortly display changes to the values of the next kind of limit. At last the result **PR55** (passed) or **FRi L** (not passed) is displayed and additionally the switching time from K1 if **ErEL** is activated.

Display automatically returns to normal mode 30 s after button Test has been pressed for the last time.

10.9 Alarm counter

The alarm counter **Ac** is increased by 1 with every shut-down. Up to 100 shut-downs are counted. That allows quick detection of how often the SPI1021 has shut down since the last delete of the alarm counter (see cumulative alarm time).

Query the alarm counter:

• Change into the display mode
• Press the  button several times until → display Acxx

10.10 Cumulative alarm time (display in hours)

The cumulative alarm time **└RL** indicates how long the relay was switched off due to an alarm. It is recorded with a resolution of 1 minute and only when the control voltage is applied.

Query the cumulative alarm time:

• Change into the display mode
• Press the ▶ button several times until → display Rcxx
• Press the ▲ button 1x → display └RL / x.xx

Delete the alarm counter and cumulative alarm time (only together):

• Display alarm counter Rcxx
• Press the ▲ button 1x → display └RL / x.xx
• Keep the ▶ button pressed for 2s until → display └RL / 0.00

10.11 Alarm Memory

Independent of the alarm counter, the SPI1021 stores the most recent 100 shut-down causes (cause, measurement value, at operating time). Simulated alarms are also registered. The LEDs indicate the cause; the tripping value that led to the alarm each stands in the 7-segment display. Alternative to that the time is shown in hours which have passed since the last tripping (with applied control voltage). These values remain saved even after the power has been turned off.

Query alarm memory:

• Change into the display mode
• Press the ▶ button several times → display Rcxx
• Press the ▼ button 1x → display x.xx / x.xx (tripping value or error no. / time that has passed in hours)
• Press the ▼ button 1x, go to next alarm

The alarm memory is only deleted during a program change.

10.12 Standby counter and standby time

The standby counter **5tby**, is increased by 1 with every standby shut-down. Up to 9999 shut-downs are counted. That lets the SPI1021 quickly detect how often, e.g., shut-down was performed through a ripple control receiver.

Query the standby counter:

• Change into the display mode
• Press the ▶ button several times until → display Rcxx
• Press the ▲ button 2x → display 5tby / xxxx

The standby time **5tby** indicates how long the relay was switched off by the standby mode. It is recorded with a resolution of 1 minute and only when the control voltage is applied and if no alarm is present.

Query the standby time:

• Change into the display mode
• Press the ▶ button several times until → display Rcxx
• Press the ▲ button 3x → display 5tby / x.xx (Time LED is illuminated)

Delete the standby counter and standby time (only together):

• Display alarm counter Rcxx
• Press the ▲ button 2x → display 5tby / xxxx
• Keep the ▶ button pressed for 2s until → display 5tby / 0

10.13 Code lock

You can protect the set parameters by enabling the code lock here.

The device acknowledges an incorrect entry with **Err** (flashes three times).

Adjustment process:

• Select the menu item with the ▲▼ buttons until → display Code .
• Press the ► button 1x → display Pin / 0
• Set the saved pin code with the ▲▼ buttons (default setting is 504)
• Press the ► button 1x → display Code / oFF
• Use the ▲▼ buttons to set the desired code lock: ○ oFF off, all parameters can be changed ○ on on, no parameters can be changed
• Press the ► button 1x → display Pin / 504
• Use the ▲▼ buttons to set the new, desired pin code (caution: write down the pin code)
• Press the ► button 1x
⇒ Code lock on, display on flashes three times
⇒ Code lock off, display oFF flashes three times
⇒ Return to menu mode, menu item code lock

If there any problems with the code lock (Pin forgotten), the lock can be switched off and the pin can be reset to 504 by keeping the Set key pressed while switching on the mains until **Code** / **oFF** appears in the display.

10.14 Sealing

All the settings and the simulation mode can be locked.

If the  LED is illuminated, the SPI1021 is locked.

If an attempt is made to change a setting in the locked state, for 3s the display shows **Loc**.

Adjustment procedure Sealing/Lock ON (OFF):

• If present, remove seal (only authorized person)
• Apply control supply voltage at A1-A2
• Slightly lift the key cover and turn 180°
• Actuate the small blue button by <u>pressing the button cover very firmly</u> (LED starts flashing) until the green LED  is illuminated.

10.15 Simulation

Here, the voltage, frequency or a vector surge can be simulated and the setting can be tested. All 3 phases plus the 10 minute mean value are always simulated. All functions of the device operate as if this value is actually being measured. Alarm and error messages are only indicated with the LEDs and not in the display. The set values are simulated until the menu item **S_i** is exited with the ▲ or ▼ button. If the SPI1021 is sealed/locked, simulation is not possible.

If the section switch feedback contacts are connected to the SPI1021 and enabled, (set value > section-switch turn-on time under **ErEL**), after a shut-down, the tripping time (dAL + time of slowest section switch) is displayed.

Adjustment process:

• Select the menu item with the ▲▼ buttons until → display S_i
• Press the ► button 1x → display S_i / U
• Use the ▲▼ buttons to set the measurement factor for simulation: ○ U Voltage + 10min mean value (frequency = last simulated value) ○ F Frequency (voltage = last simulated value) ○ uSr Vector shift
• Press the ► button 1x → display 230 (selected measurement factor is simulated)
• Use the ▲▼ buttons to set the desired value

After exiting the Simulation menu item with the ▲▼ buttons, the unit switches over to monitoring the limits. The unit automatically returns to the display mode if no button is pressed for 15 minutes.

Hint: A limit value should be tested that is higher than the set 10min mean value. If the 10min mean value has to be temporarily switched off, set (**U₁₁** → **oFF**), since otherwise it will trip first. The same applies, for example, for **U⁻**, during a simulation of **U⁻**.

10.16 Possible indications in display

display mode

AL , AN	Alarm, Alarm 10min mean value
Err5 ... Err9	Error messages (see 11. Error messages and measures)
Ac , tAL	Alarm counter, cumulative alarm time
Scn , n	Scan mode, 10min mean value

Menu mode / configuration mode

U ⁺ , U ⁻ , U ₊ , U ₋	Voltage limit value
UN	Limit value 10min mean value
H ⁺ , H ⁻ , H ₊ , H ₋ , HN	Hysteresis (if a limit value is changed, the reset value also shifts; that means it might be necessary to adapt it)
F ⁺ , F ⁻ , F ₊ , F ₋	Frequency limit value
dAL , doF	Response time, Reset time; is always counted down in the display
UonF	Frequency undervoltage (inhibited frequency protection)
uSr , rocF	Vector surge, ROCOF
dFdt , PEr	Limit ROCOF, response time in periods (4=sensitive, 50=insensitive)
Stby	Standby mode, standby-time, standby-counter
dEon	Delay Enable On, suppression time when switching on and after opening the enable input
1 Ph , 3 Ph	Single phase, three-phase vector shift evaluation
rEL , tREL	Relay, Section switch turn-on time, OFF no feedback contacts
don	Power Up delay, runs once at power up device
ModE , tRAn , dEFi	Mode, Transitory Mode, Definitiv Mode
ddi	Delay display, to calm down the display
di t	Display duration scan mode (each measurement is displayed for this duration)
Si	Simulation
F , U	Frequency, voltage
CodE , PLo , uSr	Code lock / sealing, vector shift
Pi n	Pin code (default 504)
Info	Device information, program change
Fnr , Snr	Firmware version, serial number
h	Operating hours
Err , dEL	Error counter, delete error counter
YES , no	Yes, no query for acknowledgement
Pr	Program
on , oFF	On, Off

11 Technical Data

Control voltage Us:

Rated-Connection

AC/DC 24-270 V, 0/40...70 Hz, <1,8W / <6,5 VA

DC: 20,4...297 V, AC: 20,4...297 V

Voltage drop

SPI1021 must be supplied with a UPS (>5s)

Output relay:

Switching voltage

2 x change-over contact

Max. AC 440 V

Conventional thermal current I_{th}

6 A

Inrush current (at 10 % ED)

25 A max. 4 s / 50 A max. 1 s

Nominal operating current I_e (AC 15)

6 A AC 250 V

Rated operational current

DC-13 I_e = 2 A U_e = 24 V

Rated operational voltage

DC-13 I_e = 0,4 A U_e = 120 V

DC-13 I_e = 0,2 A U_e = 240 V

Recommended series fuse

gG/gL 6 A

Contact service life, mech.

30 x 10⁶ switching cycles

Contact service life, electr.

1 x 10⁶ operating cycles at AC 250 V / 6 A

2 x 10⁵ operating cycles at AC 250 V / 10 A cos φ 0.6

Voltage measurement:

Measurement voltage phase – phase

AC 15...530 V (< 5 V: 0 is displayed)

Adjustment range phase – phase

AC 0/15...520 V

Measurement voltage phase – N

AC 10...310 V (< 5 V: 0 is displayed)

Adjustment range phase – N

AC 0/15...300 V

Measurement principle

Real root mean square measurement both half waves

Hysteresis

Adjustable 1.0...99.9 V

Measurement error (with N)

± 0.6 % of the measurement value

Measurement error (without N)

± 0.8 % of the measurement value

Display accuracy

>100V: -1 digit (res. 1 V)

<100V: -1 digit (res. 0.1V)

Measurement function

3-phase with/without N

Response time

Adjustable 0.05 (±15ms)...120.0 s

Reset time

Adjustable 0(>200ms) ... 999 s

Input resistance Phase-N

450 kΩ

Frequency measurement

Frequency range

40...70 Hz (U-L1 > **U_{onF}**)

Adjustment range

45.00...65.00 Hz

Hysteresis

0.05...10.00 Hz

Measurement accuracy

± 0.04Hz ± 1 digit

Response time

Adjustable 0.05 (±15ms) ... 120.0 s

Reset time

Adjustable 0 (>200ms) ... 999 s

Vector surge

Measurement range

0...45.0°

Adjustment range

2.0...20.0°

Response time

< 50 ms

Reset time

Adjustable 3...240 s

Delay at U_s on

Adjustable 2...20 s

ROCOF (df/dt)

Frequency range

40...70 Hz

Adjustment range

0,100...5,000 Hz/s, 4...50 Periods

Hysteresis

fixed 0,05Hz

Measurement error

± 0,04Hz ± 1Digit

Response time

adjustable 0,05 (±15ms) ... 130.0 s

Reset time

adjustable 0 (>200ms) ... 999 s

Measurement time

Number of adjusted Periods * Periods duration + Response time

Digital inputs (INx)

Output voltage +U	DC 15...35 V
Current INx	> 3 mA

Contactor feedback inputs

Voltage Y0 – Y1/2	DC 15...35 V
Current	> 3 mA
Contactor response time (section switch)	Adjustable 0.5...99.0 s

Self-test and Watchdog

in programs / alarms	Pr 1, 3, 4
alarms	U>>, U>, U10min (dAL=100ms), U<, U<<, f>>, f>, f<, f<<
Slope Rate Voltage	<150V: 2,5V/s, ≥150V: 5,0V/s
Slope Rate Frequency	0,05Hz/s
Permissible tolerance	measured value – trigger value: ≤±1%
	Response time: ±20ms
Display result	„Pass“ = passed, „Fail“ = failed
TimeOut / max. Duration	180s / 18 min (all dAL=120.0 s)
Watchdog	internally

Test conditions

Rated impulse withstand voltage	EN 60255 4000 V
Overvoltage category	III
Pollution degree	3
Rated insulation voltage Ui	300 V
Operating time	100 %
Permissible ambient temperature	-20 °C... +55 °C
	EN 60 068-2-2 dry heat
EMC - noise immunity	EN 61000-6-2
EMC - noise emission	EN 61000-6-3

Housing:

Construction form	V6
Front-to-back size	55 mm
Dimensions (W x H x D)	90 x 105 x 69 mm
Wiring connection single strand	each 1 x 4mm ²
Finely stranded with wire end ferrule	each 1 x 2.5mm ²
Protection class, housing	IP 30
Protection class, terminals	IP 20
	Mounting snap-on fastening on 35 mm mounting rail acc. EN 60 715 or with M4 screwed attachment (additional bar not included in the scope of delivery)
Weight:	approx. 250 g

We reserve the right to make technical changes

12 Maintenance and repair

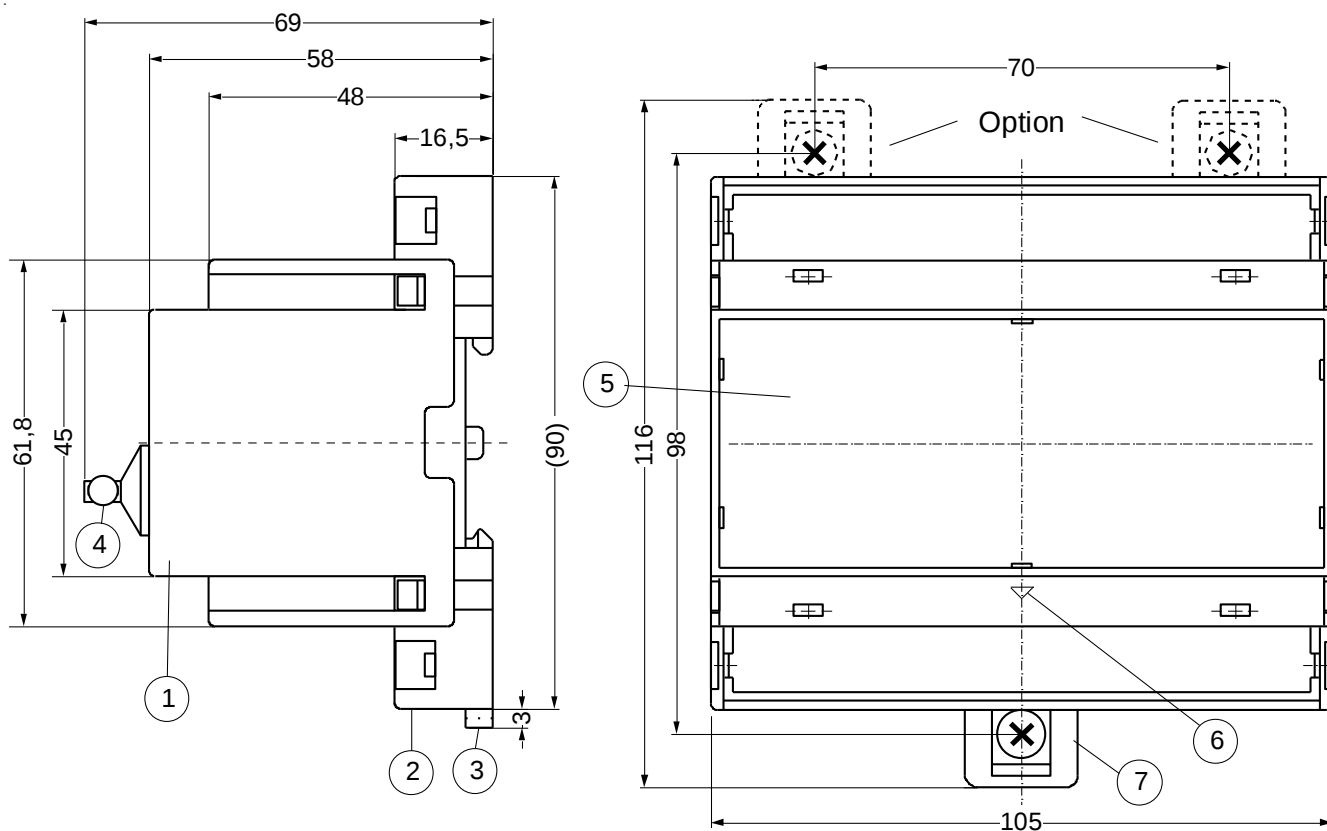
The SPI1021 is maintenance-free. Periodically test for proper functioning.

13 Troubleshooting an measures

Error	Cause	Remedy
FR.L as self-test result	Self-test failed	Check all measured voltages, check Feedback contact (see Err1)
EEEE or -EEE appears in the display	Measurement is above/below range	Measured voltage, frequency or the vector surge is too large or too small; comply with measurement range
Err5 appears in the display	Error internal interface	Reset → interrupt control voltage for >5s
Err7 also appears in the display after 2 automatic reconnection attempts, LED K1 flashes	Error when the section switch turns on, section switch connected wrong, faulty or operated from a third-party switch	<u>Feedback contacts not connected</u> Set - rEL → ErEL → oFF <u>Feedback contacts connected</u> - Check for correct connection - Set turn-on time of section switch under ErEL . - Do a reset → interrupt control voltage for >5s
Err7 LED K1 flashes and <u>K2 is operating</u>	Error when off the section switch	- Check the connection - Check for broken section switch - Do a reset → interrupt control voltage for >5s
Err8 appears in the display	Hysteresis error	Upper threshold value must be higher than the lower threshold value, check the threshold values
Err9 appears in the display	Parameter error	Reset to factory settings, see "Program setup"
A time expires in the display	Always when an OFF-delay time doF is running, it is counted down in the display (shortest one first)	Wait until the time has expired (depending on the setting, several times may elapse one after the other)
Device cannot be configured / only the limits can be configured	Code lock / Sealing activated	If there are any problems with the code lock (pin forgotten), the lock can be switched off and the pin can be reset to 504 by keeping the Set key pressed while switching on the mains until CoDE / oFF appears in the display.
Implausible voltage values	Pr selected with N, but N not connected	Select Pr without N or connect N
Loc appears in the display	Seal is active	See Sealing
CoDE appears in the display	Code lock is active	See „Code lock“
Stby appears in the display	Standby mode, E1-E2 closed	Check parameter uSr .

14 Construction form V6

Dimensions in mm



- 1 Oberteil / cover
- 2 Unterteil / base
- 3 Riegel / bar for snap mounting
- 4 Plombierung max. Ø 1,8 mm / sealing max. Ø 1,8 mm
- 5 Frontplatteneinsatz / front panel
- 6 Kennzeichen für unten / position downward
- 7 Riegel bei Wandbefestigung mit Schrauben. Riegelbohrung Ø 4,2 mm / for fixing to wall with screws, Ø 4,2 mm.

15 Disposal



Disposal should be carried out properly and in an environmentally friendly manner in accordance with legal provisions.
ZIEHL is registered with the EAR Foundation under WEEE no.: DE 49 698 543.



Dichiarazione di conformità alle prescrizioni alla Norma CEI 0-21

NOME ORGANISMO CERTIFICATORE: Bureau Veritas Consumer Products Services Germany GmbH
Accreditamento a DAKKS, D-ZE-12024-01-00, Rif. DIN EN ISO/IEC 17065
Data validità: 15-ottobre-2020

OGGETTO: CEI 0-21: 2012-06
CEI 0-21; V1: 2012-12 edizione Dicembre 2012
CEI 0-21; V2: 2013-12 edizione Dicembre 2013
CEI 0-21: 2014-09
CEI 0-21; V1: 2014-12 edizione Dicembre 2014
CEI 0-21: 2016-07
Regola tecnica di riferimento per la connessione di Utenti attivi e passivi alle reti BT delle imprese distributrici di energia elettrica

TIPOLOGIA DI APPARATO CUI SI RIFERISCE LA DICHIARAZIONE:

DISPOSITIVO DI INTERFACCIA	PROTEZIONE DI INTERFACCIA	DISPOSITIVO DI CONVERSIONE STATICA	DISPOSITIVO DI GENERAZIONE ROTANTE
	X		

COSTRUTTORE: ZIEHL industrie-elektronik GmbH+Co KG
Daimlerstraße 13
74523 Schwäbisch Hall
Germania

TIPO APPARECCHIATURA:	Protezione Di Interfaccia
MODELLO:	SPI1021
VERSIONE FIRMWARE:	0-0
NUMERO DI FASI:	trifase + monofase

NOTA:

Per impianti con squilibrio di potenza superiore a 6kW, lo squilibrio di potenza deve essere controllato separatamente.
Il modulo SPI1021 esterno assicura solo la tolleranza singola di guasto, se vengono utilizzati due moduli SPI1021 collegato in serie. Un singolo modulo SPI1021 non ha assicurato la tolleranza singola dell'anomalia.

RIFERIMENTI DEI LABORATORI CHE HANNO ESEGUITO LE PROVE:

Bureau Veritas Consumer Products Services Germany GmbH
Accreditamento a DAKKS, D-PL-12024-03-03, Rif. DIN EN ISO/IEC 17025
Data validità: 11-giugno-2019

Esaminato il certificato ISO 9001 del costruttore n°FS 529448/4542D, emesso dal British Standards Institution (BSI).
Esaminati i Fascicoli Prove n°12TH0488-CEI 0-21_3, emessi dal laboratorio Bureau Veritas Consumer Products Services Germany GmbH. Si dichiara che il prodotto indicato è conforme alle prescrizioni CEI 0-21: 2012-06, CEI 0-21; V1: 2012-12, CEI 0-21; V2: 2013-12, CEI 0-21: 2014-09, CEI 0-21; V1: 2014-12, CEI 0-21: 2016-07.

Numero di certificato: U17-0262

Data di emissione: 2017-06-23



Organismo di certificazione Bureau Veritas Consumer Products Services Germany GmbH
Accreditamento a DIN EN ISO/IEC 17065



Declaration of conformity

with the requirements of DEWA 2016

CERTIFICATION BODY: Bureau Veritas Consumer Products Services Germany GmbH
DAkkS accreditation, D-ZE-12024-01-00, ref. To DIN EN ISO / IEC 17065
validity date: 15-Oct-2020

APPLIED RULES AND STANDARDS: DEWA 2016 Version 2.0, March 2016
Standards for Distributed renewable resources generators connected to the distribution network

TOPOLOGY OF THE DEVICE COVERED BY THE DECLARATION

DISCONNECTION DEVICE	INTERFACE PROTECTION DEVICE	DEVICE FOR STATIC CERVERSION	ROTATING GENERATOR DEVICE
	X		

MANUFACTURER: ZIEHL industrie-elektronik GmbH+Co KG
Daimlerstraße 13
74523 Schwäbisch Hall
Germany

TYPE DISCRIPTION:	External IPS (Interface protection system)
MODEL / TYPE:	SPI1021

VERSIONE FIRMWARE: 0-0

NUMERO DI FASI: Single-phase + three-phase

NOTA:

For systems where the power imbalance more than 5kW, the power imbalance must be checked separately.

REFERENCE TO THE LABORATORY, WHICH PERFORMED THE APPROVAL:

Bureau Veritas Consumer Products Services Germany GmbH
DAkkS accreditation, DPL-12024-03-03, ref. To DIN EN ISO / IEC 17025
Date of validity: 11-June-2019

Examined ISO 9001 Certificate of the Manufacturer n° FS 529448/4542D, issued by British Standards Institution (BSI).

Report number: 12TH0488-DEWA-2016_0

Certificate number: U16-0447

Date of issue: 2016-08-04

Organismo di certificazione



Certification body of Bureau Veritas Consumer Products Services Germany GmbH
Accredited according to DIN EN ISO/IEC 17065